3 1761 07442876 4

REPORT

OF

THE TORONTO AND HAMILTON HIGHWAY COMMISSION.

T6863r

EcT
T6863r

REPORT [from the time of its appointment to Dec. 31st, 1921]

OF

THE TORONTO AND HAMILTON HIGHWAY COMMISSION

GEORGE H. GOODERHAM, Chairman

G. FRANK BEER
REUBEN LUSH
W. S. DAVIS
M. C. SMITH
HUGH BERTRAM
T. W. JUTTEN
THOMAS GRIFFITH

H. S. VAN SCOYOC, Chief Engineer, (1914-1918)
S. A. CUMMIFORD, Chief Engineer, (1918-1921)

Digitized by the Internet Archive
in 2010 with funding from
University of Toronto

http://www.archive.org/details/reportfromtimeof00toro

To the Honourable F. C. BIGGS, M.P.P.
Minister of Public Works & Highways,
Ontario.

Sir,—

I have the honour to present herewith the Report covering the work of The Toronto and Hamilton Highway Commission, from the time of its appointment to December 31st, 1921.

I have the honour to be,

Sir,

Your obedient servant,

"GEO. H. GOODERHAM,"

Chairman.

Toronto, February 15th, 1922.

172169
17/6/22

INTRODUCTION.

The Toronto and Hamilton Highway must continue for all time to be one of the most important sections, if not the most important section of the Provincial Highway System. Through force of circumstances, it has been constructed under special management; and it seems desirable to place on record a somewhat informal statement of the aims and accomplishments of the Commission entrusted with this work.

In August, 1914, there was much unemployment and it became evident that no effort should be spared to prevent the suffering and hardship which would result from this, especially in urban centres. Among the conferences held to consider this problem was one at which Mr. John A. Cooper, Mr. G. Frank Beer, Mr. Mark H. Irish and Mr. George H. Gooderham were present. As a result of their deliberations it was decided that the time was opportune to construct a permanent highway between the two chief cities of Ontario—Toronto and Hamilton —as such an undertaking would provide work, not only for those directly engaged in the construction, but would also afford employment for many others in providing necessary materials and supplies. A petition setting forth the general plan was therefore hurriedly prepared and presented to the Ontario Government.

PETITION TO ONTARIO GOVERNMENT

To Doctor, The Honourable J. O. Réaume, M.P.P. Minister of Public Works, Province of Ontario, Legislative Buildings, Queen's Park, Toronto.

Sir:—

It is generally conceded that lack of employment during the next few months will produce poverty and suffering throughout the Province of Ontario, and particularly in manufacturing and largely populated centres.

That there will be notable response to calls for aid to charity, no one doubts, but there is a strong feeling that an effort should be made to relieve the situation by providing

work, in contradistinction to the distribution of alms, and arranging for its certain continuance by satisfactory financing, thus ensuring at least the necessities of life to many who would otherwise become a public charge.

In these circumstances, we venture to present for your consideration, and the consideration of your colleagues in the Cabinet, a plan looking towards this desirable end. In so doing we beg to assure you that the project has the hearty support of many influential residents in this province, as evidenced by the financial arrangements later referred to.

We propose that the people of Ontario shall collectively lend their credit so that payment for the construction of a Concrete Roadway between the Cities of Toronto and Hamilton, via a route herein submitted, may be guaranteed and immediately proceeded with.

We submit that this project should have your support and the support and sanction of your colleagues because:—

1. It will give instant and practically continuous employment to thousands of men at height of the present depression.

2. It will create for the Province a valuable asset at a price far below its cost in normal times and this with the approval of all labour interests.

3. It places no unbearable burden in taxation, the outlay being borne solely by the ultimate beneficiaries and equally distributed among them.

4. It is relief work of the most practical kind.

THE ROUTE

We propose that the road shall be built over what is known as the "Lake Shore Route" for the following reasons:

1. As the highway is to be of the most approved permanent construction designed to carry unlimited loads, and intended for the economical transportation of freight, it should follow the lowest gradients. The Lake Shore Route does this.

2. Having secured the lowest gradients, it is desirable to pass through districts where the taxation will be distributed over the largest possible number of property owners. On the Lake Shore Route is found the greatest number of small holdings abutting upon the proposed highway or affected thereby.

THE CONSTRUCTION

The road will be constructed of concrete, in the most approved and up-to-date manner similar to highways already laid in Wayne County, State of Michigan, and also in Sarnia, Ontario. It will be a 24-foot road, 16 feet of which will be of concrete bearing a 4 foot shoulder on each side. It will be designed with a view to accommodating fast and slow moving traffic at a minimum of upkeep per annum.

THE NORMAL COST

Material	Freight	Per sq. yd.	Per mile
Cement, $1.40 per bbl	f.o.b. R.R. siding	45c.	$4,224.15
Sand, $1.30 c. yd	" " "	11c.	1,032.57
Trap stone, $2.40 c. yd	" " "	11c.	1,032.57
Base stone, $1.25 c. yd	" " "	16c.	1,501.92
Joints, .01 sq. yd			93.87
Total cost, material and freight		84c.	$7,885.08

LABOUR AT 20 CENTS PER HOUR

	Per sq. yd.	Per mile
Labour on joints	.01	$ 93.87
Mixing and placing concrete	.16	1,501.92
Rolling sub-grade and shaping shoulders	.20	1,877.40
Grading and ditches	.10	938.70
Loading and teaming to job	.26	2,440.62
Total labour	.73	$ 6,852.51
Materials, freight and labour	1.57	14,737.59

Total cost of road, approximately 40 miles, $589,503.60 without expense of management.

SAVING

You will appreciate the limited time at our disposal prevented even our enumerating the possible savings from different sources that might be confidently expected, but as a surety we submit the following as already in our hands:—

Cash contributions from cement interests.....	$ 25,000.00
" " " stone interests.....	12,000.00
Reduction in cost of labor.....	102,787.60
	$139,787.60

This will undoubtedly be substantially augmented in a supplementary report, should you favorably receive this suggestion, and we leave the point for your imagination, confidently believing that the railways and patriotic private means will still further reduce the general cost.

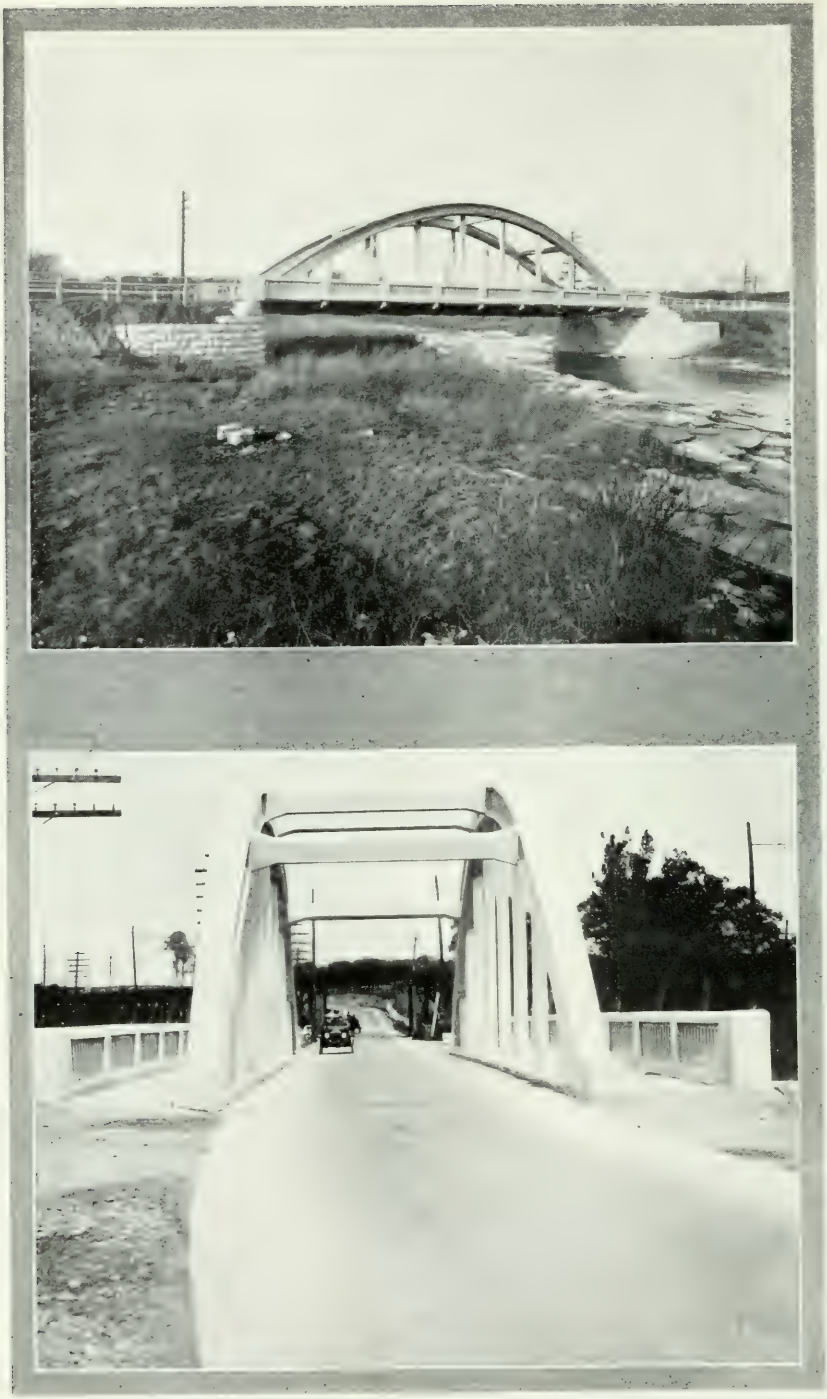
A reference to the above figures will at once acquaint you with the fact that the material for the project is to be supplied at cost or even below. This has the dual advantage of reducing the cost of construction and in preventing an increase in the number of unemployed.

METHOD OF PAYMENT

We should suggest that the road be paid for in a period of twenty years by the various parties interested, by the issuance, after the interim financing hereinafter suggested has been completed of 5 per cent Sinking Fund Bonds, or similar securities, insuring the repayment to the Government of the money advanced through its credit during the interim period. The burdens to be borne will be as follows:—

City of Toronto already having agreed to this undertaking, the sum of.....	$125,000.00
City of Hamilton, similarly.....	25,000.00
Provincial subsidy, $4,000. per mile.....	160,000.00
Municipalities, $4,000. per mile.....	160,000.00
Property taxation, frontage and area	143,000.00
	$613,000.00

Near Oakville



Etobicoke Creek Bridge

The only item requiring explanation is that of the "property taxation" and our suggestion is that properties immediately abutting the roadway pay 1½c. per foot per annum; the next fifty acres in the rear 15c. per annum, and the next fifty acres in the rear 10c. per annum. This has been found to produce the sum above laid down on a 5 per cent twenty year basis. Whether the taxation on the property should be more is a matter for your consideration, but we submit that, as presented by us, it forms a most reasonable tax owing to the benefit to be derived from the properties served by the road, both in convenience and enhancement of value.

The Government should guarantee the maintenance for fifteen years, adding this to local taxes if thought desirable.

IMMEDIATE FINANCING

The permanent financing we have roughly outlined above. We now suggest that the permanent financing be postponed for a period of possibly five years, and that during this interim, evidence of security be issued by the Province bearing interest at 6 per cent per annum. (This evidence of security is, of course, for the judgment of yourself and your colleagues.)

Taking for granted that the security will carry with it the credit of the Province, we undertake to dispose of the amount necessary to construct the road, at par, and in addition to this we will place these securities in hands where we shall receive an undertaking that they will not be put upon the market, but will be held during the decided upon period. At the end of this period, we propose the method of permanent financing above outlined, which could then be arranged for, and would take care of the temporary flotation.

We believe that we should add that it is our intention to place this loan among a very limited number of citizens whom we believe are patriotic enough to enter into this project to relieve existing conditions.

We urge that the construction of this Highway be placed in the hands of a commission, composed of five members who shall be elected and appointed by the Lieutenant-Governor in Council, who shall have for his first object business efficiency in the personnel thereof. We urge that the appointees be of such high standing that the fullest powers may be confidently vested in them".

"Geo. H. Gooderham"
"Mark H. Irish"

Toronto, August 27, 1914.

REPORT OF MR. R. P. FAIRBAIRN

The Government gave this matter prompt and careful consideration as is evidenced by the report of Mr. R. P. Fairbairn Deputy Minister of Public Works, which stated:

Honourable J. O. Réaume,
Minister of Public Works,
Ontario.

Sir,—

I have the honour to report upon the proposal to construct The Lake Shore Toronto Hamilton trunk road, during the next few months in order to relieve unemployment.

As a measure of relieving unemployment the scheme as outlined is commendable and the roadway is urgently needed. The work is of such character that unless launched at once there would be a great deal of broken time from rain and frost as concrete work cannot be conducted in wet or frosty weather. The scheme is too important to risk defective work in its construction. The concreting could not be continued with safety beyond November 1st. or 15th. at latest and any road less durable than a concrete one would not be satisfactory. The only part of the work that could be done in advance of the

concrete would be in such sections that require cuttings and fillings to provide the maximum grade to be determined upon.

While the scheme cannot be completed from City to City before severe weather, I believe that the sections of bad road could profitably be undertaken at once or in as short time as necessary to complete plans and organize construction gangs.

The emergency financing for five years upon evidence of security issued by the Province at six per cent would give the Province, the Municipalities and other interests ample time to determine a sound financial policy to complete the work on a satisfactory and equitable basis.

The management by a Commission as suggested, would enable the work to be undertaken without delay and if any progress is to be made with the work, construction should be commenced as early as possible. This is entirely a scheme for work during the Fall months and would not be profitable for Winter employment. The organization could however resume in the Spring months on a good business basis even if unemployment was not acute at that time.

The survey is completed on this work by the Highways Branch of the Department, the best route is practically determined and the grades can be established in a short time.

I would therefore respectfully recommend the commencement of the work upon the plan as outlined on those portions of the route that are in poor condition and before severe weather would stop operations, a fair highway between the two cities could probably be constructed.

I have the honour to be

Sir,

Your obedient servant,

"R. P. Fairbairn"

Deputy Minister of Public Works.

Toronto, Sept. 4th., 1914.

REPORT OF MR. W. A. McLEAN

A more complete report was also submitted by Mr. W. A. McLean, M. E. I. C., at that time Highway Commissioner. It was dated September 2nd., 1914, and read as follows:

Sir:—

In pursuance of your request, I have read the statement respecting the Lake Shore Road, presented by Messrs. Gooderham & Irish, and would respectfully advise as follows:—

THE ROUTE

The Lake Shore Road should be selected for paving for the reasons stated, with the proviso that provision be made in Toronto Township for a deviation to avoid a series of hills; this, I understand, can be arranged.

In selecting a route, the question is not — which shall be a good road?—for Dundas Street, the Middle Road and the Lake Shore Road, should all, in the near future, be substantially constructed as good roads.

The present consideration is—which shall be the paved road to accommodate fast automobile and heavy truck traffic between the two cities of Toronto and Hamilton?

From a careful consideration of all conditions I am strongly of the opinion that the Lake Shore Road will under any circumstances receive the most severe traffic of all kinds; that if a pavement were constructed on the Middle Road, or Dundas Street, and an ordinary macadam on the Lake Shore Road, the Lake Shore Road would still attract the greatest amount of fast traffic, such as a macadam would not support, and the result would be a heavy outlay for maintenance along that road. A pavement on the Lake Shore Road and macadam on the other roads considered, would undoubtedly prove the most economical arrangement.

THE CONSTRUCTION

The construction proposed should be subject to careful consideration. The roads of Wayne County are built of a one-course mixture, using clean washed gravel.

The proposal in the present instance is to construct a two-course pavement using limestone for the base and trap rock for the surface. The method proposed is not as safe a type of construction as that followed in Wayne County or Sarnia but may become necessary upon a more careful consideration of cost.

NORMAL COST

The estimate of normal cost is probably low and might be expected to amount to $18,000 per mile. As the length to be constructed is nearly 36 miles the total cost might be estimated at $650,000 exclusive of culverts and bridges.

SAVING

The estimated saving is based upon cash contributions and reduction in the cost of labour which are wholly subject to the efforts of the petitioners.

METHOD OF PAYMENT

The method of payment is a reasonable approximation of what might, after careful consideration, be reached. I am of the opinion, however, that the City of Toronto, in particular, should contribute a greater amount to the cost of this road; and also that a larger amount might be collected as a direct property tax. The cities of Toronto and Hamilton have, however, each offered to contribute the respective sums stated by the petitioners. With respect to the property tax, I am attaching a sketch which will indicate more fully their suggestion.

IMMEDIATE FINANCING

The method of immediate financing was one which the Highway Commission did not consider fully, but which was realized, in such cases as the Lake Shore Road, to offer some difficulty. The proposal of the petitioners, however, if satisfactory security is given, would form a convenient solution in the present instance.

MANAGEMENT

The proposed system of management is in keeping with the views of the Highway Commission with respect to inter-urban roads. It was suggested that the control of the road should be vested in a Board of Trustees for construction and possibly for subsequent control for a term of years. It was believed, however, that some representation should be given to the various municipalities interested.

FURTHER CONSIDERATION

Legislation would be necessary but so far as information is before the writer, I see no reason why this might not reasonably be guaranteed.

The several municipalities have all asked for the construction of such a highway; its urgent need is recognized; and the property-owners have petitioned for its construction, offering to pay the proposed tax of 1½c per foot frontage for a term of 30 years.

If the term were reduced, the rate per foot frontage might reasonably be increased. The property immediately fronting on the road will in the great majority of cases be readily saleable for residential purposes and market gardens. Farm owners would in this way—in nearly all cases—release themselves from the frontage tax and would bear only the area tax for the suggested term.

The season is rapidly advancing and concrete cannot be laid in wet or freezing weather. Grading, however, could and

New Reinforced Concrete Culverts

Dangerous Curves Near Bronte Eliminated by Diversion

should in several cases be carried out this fall, and much could be done to place material on the ground, thereby keeping the quarries in operation.

The survey of this road is completed. It is staked for construction and plans could be quickly furnished.

I have the honour to be, Sir,

Yours respectfully,

"W. A. McLean," Commissioner.

While these reports did not confirm all the statements in the petition presented, they did support the proposal.

AUTHORIZATION OF THE TORONTO AND HAMILTON HIGHWAY COMMISSION

By Order-in Council dated September 17th., 1914, the Toronto and Hamilton Highway Commission was created. It originally consisted of Mr. George H. Gooderham, Chairman, Toronto, Messrs. G. Frank Beer, Toronto, Cecil G. Marlatt, Oakville, Maxwell C. Smith, Burlington, and T. W. Jutten, Hamilton. Mr. Marlatt was not able to act, however, and Mr. W. S. Davis, Oakville, was appointed in his stead on September 23rd. and Mr. Reuben H. Lush of Clarkson and Hugh Bertram, Vinemount, were added October 9th. No further changes were made in the personnel of the Commission until January 1920 when Mr. Thomas Griffith of York County was added. Mr. Hugh Bertram, resigned January 26th., 1921, and the vacancy remains unfilled.

AGREEMENTS WITH MUNICIPALITIES

The members of the Commission at once began to meet the Councils of the various municipalities outlining the plans of the Commission and submitting agreements covering the obligations to be assumed. In most instances the acceptance was immediate and on October 16th., 1914 the Commission was advised by the Government that work could be proceeded with when the agreements with Toronto and

Hamilton were signed. The City of Toronto forwarded its agreement October 26th. 1914, and Hamilton followed on October 27th., 1914.

VISITS OF INSPECTION

In order to have first hand information regarding highway building, the commissioners, singly, or in groups, visited Detroit, Michigan, and spent several days in going over the concrete roads in Wayne County; in Albany, for an inspection of New York State Highways and a discussion with the State Highway Commissioner; Boston, Mass., and Montreal, Que.

On November 4th., the Commission employed the first member of its staff, the Chief Engineer, and on November 8th, the first construction gang was at work.

ROUTES

The first idea of the Commission was to follow as closely as possible the Lake Shore from Toronto to Hamilton. With this purpose in view, a number of surveys were made, especially in the Lorne Park District, and West of Burlington.

PROPOSED LORNE PARK DIVERSION

In the Lorne Park section a desirable route could have been secured by turning south from the present Highway just west of the Lorne Park Station Road, following a suitable grade line through the farm lands and joining the old highway east of Milligan's Corners. (See Appendix Page 41) In this way much of the heavy grading in this district would have been avoided, and in addition the right angled turns at Lush's Corners and Milligan's Corners would have been done away with. The natural scenery would have added greatly to the charm of the highway and land difficult of access would have been opened up. Most of the property owners saw the advantage that would come to them, and were willing to give the right of way required. One or two were so utterly unreasonable that the whole idea had finally to be regretfully

abandoned. The old meeting house at Clarkson was so rich in associations that it was impossible to make satisfactory arrangements for a turn at that corner, and the Commission of necessity went west to the next concession line before turning south.

HEEKS DIVERSION

Three miles west of Oakville a very abrupt turn was avoided and the distance shortened by the Heeks Diversion. The Commission purchased this tract of land at a reasonable price and retain the excess acreage. It is their intention to create here a public park where the Public may rest or picnic without interference.

CRABB DIVERSION

Within the first mile west of Bronte on the old roadway there were four right angled turns. A cemetery on one side made a change in line almost impossible and in addition, the right of way was gradually being eroded into Lake Ontario. All of these difficulties were overcome by acquiring a new right of way by purchase or expropriation. The distance was again shortened.

CURTIS DIVERSION

Just east of Port Nelson a very great improvement in location was made by the Township of Nelson just previous to the formation of The Toronto and Hamilton Highway Commission.

PROPOSED EAST FLAMBORO DIVERSION

One of the most difficult problems that arose during the selection of the route was in the section west of Brant St., Burlington. An acceptable location was found paralleling the shores of Burlington Bay and quite close to it, but an entirely new right of way would have been necessary. Very generous offers were made to the Commission by those favoring this route. Unfortunately, however, a portion of it would have been included in a cemetery and as no suitable arrangement could be made covering this section, this location had to be given up.

Another proposition was to turn north at Brant Street, making a short diversion near the Grand Trunk Railway tracks to avoid a level crossing. An open water course on Brant Street made this location undesirable. It was finally decided to open a new highway for about one mile west of the Brant Hotel, Burlington, to intersect with the King's Road.

PROPOSED QUEEN STREET DIVERSION

When the surveys made by the Commission disclosed that much of the Highway in the section nearest Toronto was considerably less than sixty-six feet in width, although it would undoubtedly be required to carry the heaviest traffic, and in addition was burdened with a Radial Railway track, an effort was made to discover a new location. It was found that by following Queen Street west from the Humber River, as far as it was opened, and then providing a new right of way diagonally to the Lake Shore Road that there would be a saving in distance and avoidance of the many intersecting roads and streets in Mimico and New Toronto, and the absence of a radial railway. There would also have been a new truck farming district opened up and provided with direct access to Toronto's markets.

Opposition developed to any change from the Lake Shore Road, however, and the Commission regretfully abandoned this idea.

WIDTH OF HIGHWAY

A right of way one hundred feet in width was very seriously considered by the Commission, but it was found impracticable to carry this out, except by the expenditure of a large sum for the land. At the invitation of the Commission, Mr. Thomas Adams, Town Planning Adviser to the Conservation Commission, Ottawa, Professor A. T. Laing of the University of Toronto, and Mr. W. A. McLean, then Highway Commissioner, made a careful survey of the route of the Highway. Their advice was of great assistance not only in selecting the final route, but was largely responsible for the decision of the Commission to adhere to a right of way sixty-six feet in width with a by-law restricting building on an additional strip

twenty feet wide on either side of the highway. Almost without exception the various municipalities interested have supported this idea of a clear space of one hundred and six feet in width.

TYPE OF CONSTRUCTION

While the original petition presented to the Government mentioned specifically a concrete road, the legislation creating the Commission provided only that a permanent Highway should be constructed. The inspection trips already mentioned, however, served to confirm the original intentions of the Commission and led to the final decision to build the Toronto-Hamilton Highway of Concrete. The observations of the members of the Commission, the recommendations of their own Engineering Staff, and the practically unanimous opinion of all of the road authorities consulted, led to the conviction, however, that it would be a very grave mistake to build a concrete roadway less than eighteen feet in width. This extra two feet of concrete, it was believed, would, to a large extent, do away with traffic on the shoulders, so it was decided to build the shoulders of earth.

The use of open ditches for drainage purpose was entirely a matter of lower construction costs. The Commission would have much preferred tile drains and went so far as to make estimates of the additional cost of installing them, and to offer to replace, and did replace, the open ditches wherever the municipalities or the individual property owners would assume the extra cost.

After careful consultation with Mr. W. A. McLean, it was decided to grade the highway for a minimum width of twenty-six feet in fill and thirty feet in cut, and to reduce the grades on the highway to 4%.

INVESTIGATION OF MATERIALS

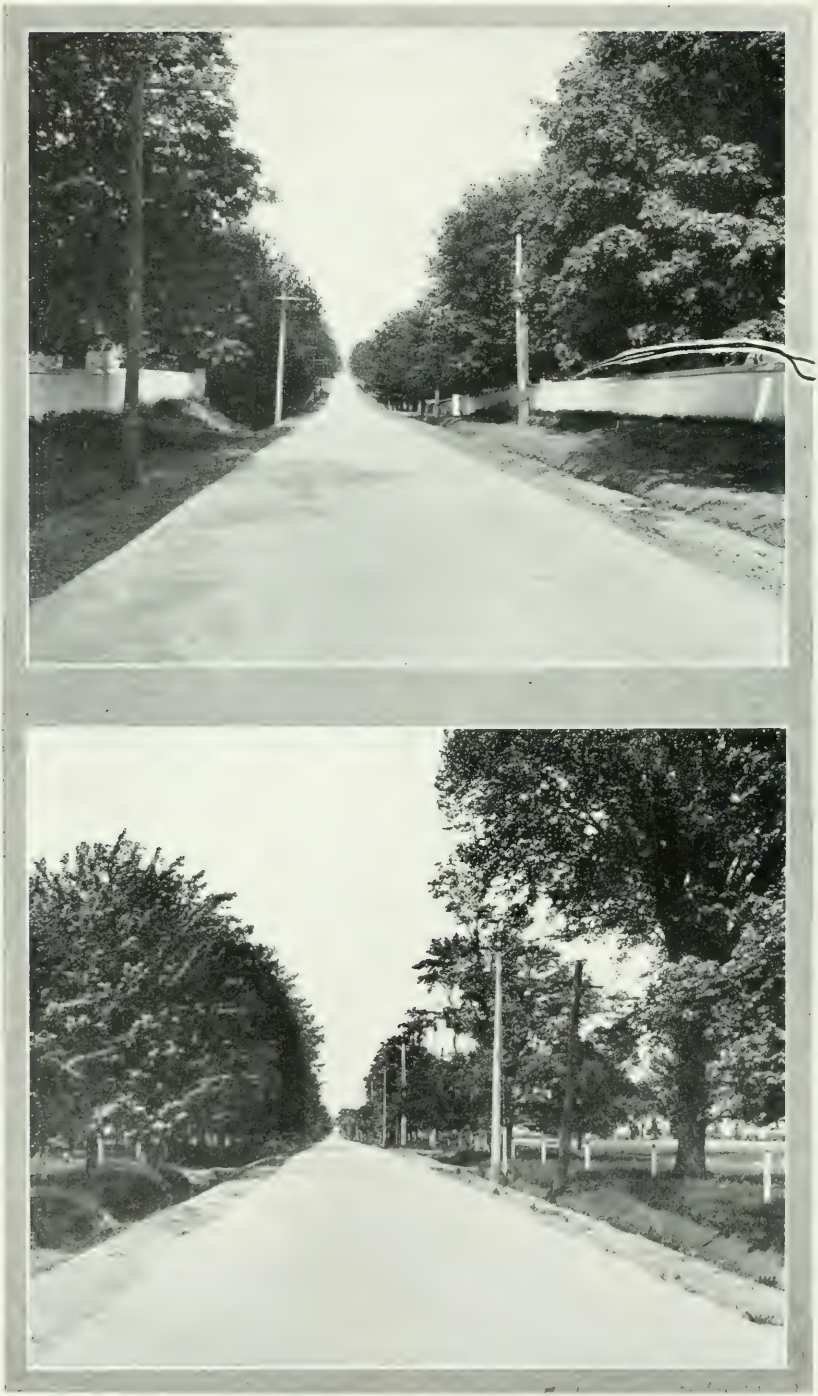
The fact that the Toronto-Hamilton Highway was undertaken before the Provincial Department of Highways had been re-organized, made it necessary for the Commission to carry out a careful investigation of the various sources of supply for sand, gravel and crushed stone. More than one hundred samples of sand and gravel were tested. Stone from practically every quarry in the Province, operating commercially, was tested for hardness, toughness, resistance to abrasion, and as to specific gravity. Tenders were invited from all the localities in position to supply materials of satisfactory quality. As the stone was to be used by the cubic yard, but was to be bought by the ton, its specific gravity was taken into account when the various tenders were compared. In all of its purchases the Commission followed the policy of laying down a standard of quality and then buying on a basis of price. More detailed information concerning the investigations and tests of materials is given in the Appendix.

SPECIFICATIONS

One purpose actuated the Commission throughout all of its work and that was to construct a highway first class in every respect. The specifications were drawn with this idea in mind. They are included in detail in Appendix Page 31.

The Highway was begun as an aid in relieving unemployment. The Commission never lost sight of this fact. One of the first things done by them was the establishing of registration bureaus in Toronto and Hamilton. Investigators personally visited the homes of all applicants for work, and as vacancies occurred they were filled by those in the greatest need. During the Winter weather, gloves and other necessary articles of clothing were supplied the men upon the requisition of the foreman in charge of the work. Gangs were rotated every three weeks in order to take care of as many men as possible. Attention was also paid to the percentage of contributions to the cost of the Highway made by the various

Improved Alignment West of Bronte



East of Oakville

municipalities interested, and as nearly as possible, labor was taken from each municipality in proportion to its contribution.

As much of the labor was from Toronto and Hamilton it was soon evident to the Commission that camps would have to be provided. They insured the men satisfactory food and comfortable quarters at a very low rate. It was hoped that they might be made to be self supporting, as far as supplies and service were concerned, but this was not found possible.

ORDER OF PROCEDURE IN THE BEGINNING

As most of the men employed were from Toronto and Hamilton it would have been desirable to have begun the work as close as possible to these centres. Some Winter work was done near Hamilton but conditions in York County were such as to make work near Toronto impossible. The original survey made previous to the appointment of the Commission began not at the Humber, but at the western limits of New Toronto. No agreement could be reached with The Toronto and York Roads Commission, who planned to extend the existing Dollarway pavement on the Lake Shore Road. Mimico and New Toronto had outlined a plan for a roadway eighty-six feet in width. A sewerage system and extensions to the water system were being installed in both of these Municipalities. A survey of the section east from the western limits of New Toronto showed that part of the right of way east of Church Street, in Mimico, was as narrow as thirty-eight feet. The rights of the Toronto and York Radial Railway Company were undefined. Work in York County was entirely out of the question in the Fall of 1914. As a matter of fact, the necessary agreements with the municipalities in this County were not finally completed until September 13th., 1917.

Naturally work was carried on during the Winter months where the heavy grading was to be done. Great difficulty was experienced in making arrangements for proper railway sidings. This prevented the storing of sand and stone before June, 1915, and seriously interfered with the progress of the work in that year. No concrete was laid until July 21st., but before the end of the year, 162,841 square yards of paving were completed.

By 1916 labor conditions had changed to such an extent that workmen were brought from Northern Ontario. In spite of great difficulty in securing some of the materials, practically all of the work was completed outside of that in York County by the end of 1916. The York County work was completed in 1917, and the Highway was formally opened to traffic on November 24th.

ESTIMATES

A statement as to the probable cost of the work was included in the original petition presented to the Government. It could not, however, be considered a preliminary estimate of cost, as not even the route to be followed was known when the figures were submitted. It provided only $938.70 per mile for grading and drainage, and was based on the belief that the Commission would operate directly under the Department of Highways, and made no provision for expenses of management, engineering, etc. Nothing was allowed for bridges or culverts although the location near Lake Ontario would mean a maximum expenditure for drainage structures. The cost per mile mentioned in the petition to the Government was $14,737.59.

On April 10th., 1915 preliminary estimates prepared by its own Engineers were presented to the Commission covering the thirty-one miles of Highway nearest Hamilton. They provided $6820.08 per mile for grading and estimated the average cost per mile as $25,487.59.

Revised estimates were submitted to the Government in April, 1916, when the method of financing the proposition was changed.

Estimates for the York County work, and detailed statement of cost for the various sections of the work are given in the Appendix.

METHOD OF FINANCING

In the proposal presented in 1914, it was definitely stated that if temporary bonds were issued for five years bearing the guarantee of the Province, that they would be disposed of at par to persons who would give an undertaking not to put them on the market until a period agreed upon had expired, in order to avoid any interference with war time financing.

PROGRESS OF WORK

The detailed statements in Appendix include the quantities for the various classes of work. Reference has already been made to the order in which the work was carried out. It is possibly of interest to add that the best record made by the Commission in 1915 of laying six hundred and thirty running feet of concrete roadway eighteen feet in width, was a Canadian record that was not beaten until 1921, and that it has not yet been equalled by a machine of similar capacity.

BRIDGES

In the original statement, no provision was made for bridge or culvert construction. In the Commission's estimates all structures other than County bridges were built entirely at the Commission's expense. Fifty-five structures with spans up to fifty feet were built in this manner. The larger bridges at Mimico Creek, Etobicoke Creek, Credit River and Bronte, were built by the Commission, but were paid for under a special provision of the Act, which made the various municipalities responsible for such share of the cost as they would have been called upon to bear if the Toronto and Hamilton Highway had not been built. All structures are of concrete, or reinforced concrete, the four large ones being especially noteworthy as they are by far the largest spans of this type yet constructed in Canada.

POLICING OF ROAD

Early in 1916 it was brought to the attention of the Commission that there were many instances of speeding with serious, and in some cases, fatal accidents to law abiding users of the Highway, and especially to farmers residing along the Highway. The Commission decided that this condition must be remedied. Accordingly, Constables were appointed with jurisdiction over certain sections. From the very beginning the Constables have been paid fixed salaries bearing no relation to the number of summonses or to the number of convictions. At first various Magistrates, at convenient points along the Highway, heard the cases. They received the costs. Recently a Magistrate with jurisdiction over the entire Highway has held Court at such points as were most convenient to the persons summonsed. He is paid a yearly salary, and all receipts from this Court go directly to the Commission, and are applied to the maintenance of the Highway.

Possibly no work of the Commission has been more bitterly criticised than its prosecution of the speeders. The Commissioners, at all times have, however, had in mind only the necessary protection of the careful user of the Highway, and have been very willing to explain their policy and to demonstrate its operation to representatives of responsible interested associations. Appreciating more fully than is possible for any one not directly connected with the Commission, the very heavy traffic that the Highway is called upon to carry and the utter thoughtlessness of a small percentage of the drivers, the members of the Commission view with misgiving any attempt which may be made in the direction of leniency. It would seem that a great number of summonses is issued, but when it is appreciated that the total number of summonses for a year is only equal to the total traffic for three hours of a busy day, it is evident that there can be no hardship suffered by the careful driver.

The increase in traffic that has followed the construction of the Highway is well shown in the following statement.

A traffic census was taken by the Provincial Department of Highways in 1914 before construction work was begun. The Commission has taken counts yearly since on days which it was felt would show a maximum traffic count.

Year	1914	1916	1917	1918	1920
Motor cars	262	1876	3065	4429	7783
Motor trucks	3	142	107	93	131
Light horse drawn vehicles	199	271	148	20	4
Heavy horse drawn vehicles	56	184	41	51	37
Miscellaneous		781	479	1081	448
Total	520	3254	3840	5674	8403

Much effort has been expended by the Commission in attempting to regulate the erection of signboards in the vicinity of the Highway. Many objectionable ones have been removed, and thousands of disfiguring metal signs destroyed. Progress is still being made in improving conditions by the co-operation of the interested municipalities.

Another regulation which is enforced largely by the efforts of the Constables, is the Building Restrictions. It seems that constant vigilance is necessary to prevent the erection of buildings or other structures within the prescribed limits.

MAINTENANCE

Detailed figures of maintenance costs are given in Appendix, Page 54 and it must be a source of satisfaction to the different municipalities to note the splendid condition of the road, (see Report, Appendix, Page 38) and the way in which it is standing the traffic, at a total cost to the Municipalities for six years of $23,748.11. The City of Toronto—the largest contributor, has paid $9125.11 as it's share during this period, while the share of the smallest contributor—the Town of New Toronto, was $108.57. It seems desirable to point out, however, that this Highway is kept open practically every day in the year, which means a large expenditure for snow removal not found on other Ontario roads. More than $9,000. has been spent on Tree Planting, pruning and protection, and more than $23,000. in repairs, ditch-cleaning, grass cutting and similar items which tend to make the Highway a pleasure to the eye,

as well as a comfortable place to travel. The cost per mile of macadam maintenance as compared with the concrete deserves special attention.

WORK UNCOMPLETED

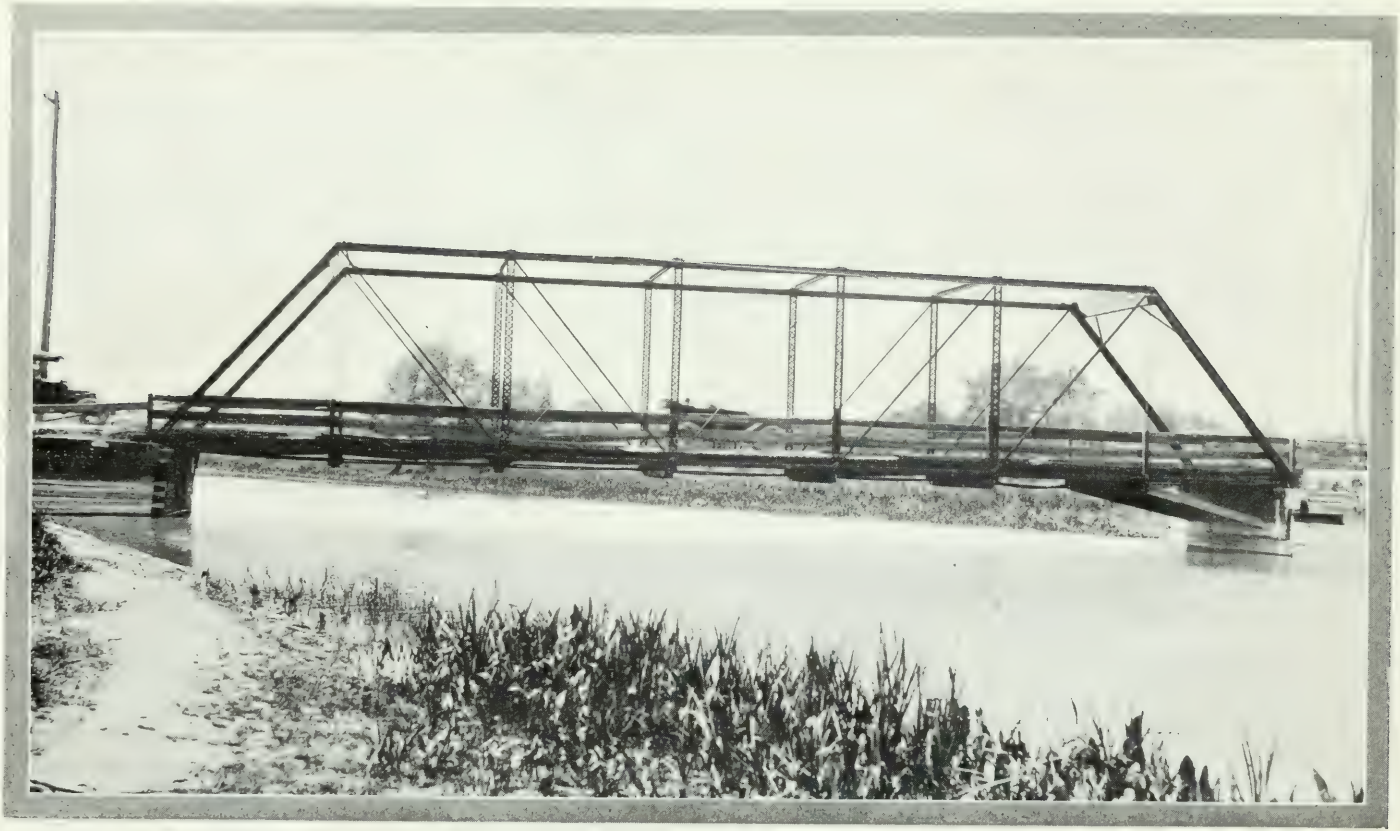
Since the Department of Highways has taken over the Hamilton Entrance, the only capital expenditure necessary for a completed Highway is for a new bridge at Oakville. The Commission realized that the Oakville Bridge was not in keeping with the other bridges along the Highway, and an examination showed that the structure did not conform to the standards of the Department of Public Highways for bridges on Provincial Highways. Accordingly plans and estimates for a new bridge were prepared and application was made to the Ontario Railway and Municipal Board for an order apportioning the cost of the work. The Board concurred in the opinion of the Commission that the bridge should be replaced, but it subsequently developed that under section 449 of the Municipal Act, the Town of Oakville would be responsible for the cost of the new bridge—no share being chargeable to the County of Halton. The Commission, realizing that the existing bridge was probably ample for the needs of Oakville, and that the replacement was necessary only on account of the through traffic, endeavored to secure Legislation to enable the Province and County to pay their share of the cost. This was not obtained, however, and the bridge has been kept repaired.

The Commission has also had in mind the constructing of some more permanent form of shoulders, which would be capable of standing up economically under present and future traffic conditions. Many items of minor importance are considered from meeting to meeting, and carried out as conditions permit.

THE STAFF

The staff responsible for the carrying out of this project are worthy of the greatest commendation, and their hearty co-operation under what were, at times, very trying conditions is deserving of special mention. The Engineering Staff was entirely composed of men of British birth or training, and with very few excep-

A Section Near Bronte Showing Easy Curves



Old Credit River Bridge

tions were Junior or Corporate Members of the Engineering Institute of Canada, and many of the men in the construction department had engineering training. Mention can well be made of the splendid results secured by Mr. H. S. Van Scoyoc, M. E. I. C., Chief Engineer, whose judgment was responsible for the efficient organization entrusted with all the details of construction. Upon Mr. Van Scoyoc's resignation in March, 1918, Mr. S. A. Cummiford, A. M. E. I. C. was appointed to the position of Chief Engineer.

CONCLUSION

This record would not be complete without reference to the harmonious relations that have at all times existed among the various members of the Commission. Propositions offered have been freely discussed, but decisions on all important questions have been unanimous. Each member has felt an individual interest in the road since the work first started. Scarcely a day has passed that the entire extent of the Highway has not been inspected by at least one or other of the Commissioners. Matters requiring attention have been reported promptly to the Chairman. Rarely has a stretch of road of equal length been patrolled so systematically and carefully; it has been a real labor of love. Nearly one hundred and twenty-five meetings of the entire Commission have been held, and the Chairman has personally attended thirty-three formal meetings with representatives of the Municipalities. In addition to this, hundreds of informal meetings have been attended by the Chairman, and the other members of the Commission. There has been on the part of each Member of the Commission a striving for a Highway worthy of the importance its location gives it. For over seven years the members of the Commission have given their time and energy in directing the building and maintenance of this great Highway without one single dollar of compensation, but have been reimbursed their personal expenses for postage, telegrams, telephone, railway fares, etc. $2682.48. Half of the Highway is well on its seventh year of wear. That it has been a blessing to the districts it serves will be universally admitted. That it may continue to give the ever increasing service of which we believe it has shown itself to be capable, is the wish of the Toronto and Hamilton Highway Commission.

LETTER FROM MEMBERS OF THE COMMISSION TO THE CHAIRMAN

Toronto, Feb. 15th. 1922.

Mr. Geo. H. Gooderham,
Toronto,
Ontario.

Dear Mr. Gooderham:

On the conclusion of our labors as Members of the Toronto and Hamilton Highway Commission, we now tender our resignations to you as Chairman, that you may transmit them to the Government of the Province of Ontario, to take effect as and when the Legislature of Ontario shall be pleased to accept the same, and relieve us of the duties of Office as Members of the Commission. The Highway, now successfully completed, has been a great undertaking in the Public interest and is proving a boon to the multitudes who use it for business and pleasure.

We cannot let this occasion pass without expressing to you our heartfelt appreciation of the unselfish and ungrudging spirit in which you devoted thought, time, energy and wide business experience to the construction of this road. We recall the days, when in 1914 the Commission was organized under your Chairmanship, and the uncertainties and trying conditions which necessarily beset the task; we remember our first journey of exploration over the road; the difficulties of locating the proposed highway so as to meet the greatest need of the greatest number; the process of purchasing the right of way through farms; the elimination of dangerous curves and sharp angles; the establishing of construction camps; the buying of railway equipment and the best possible materials; and the problem of enforcing a wise regulation policy. As we call to mind these achievements of the past, we realize afresh how all-important was the part you played in the building of this Highway, and in the whole good roads movement of this Province.

The future of Good Roads in Ontario was largely dependent on the success of our efforts to provide in the Highway a first class road at the lowest possible cost. Your share in this success influenced for good all subsequent development of Provincial road policy.

To carry out the details of such a work as the Highway, the services of a General Manager are normally required. The expenses of a special manager you saved to the undertaking by yourself assuming this burdensome duty. You gave the personal direction and supervision that were needed. At times you personally guaranteed large sums of money necessary to carry on the work without interruption. Through your efforts, tens of thousands of dollars have been saved to the Municipalities. We, your Co-Directors know these facts. The people of the district should also be made aware of what you have done; and as they learn it, they will render you a special tribute of gratitude.

We cannot lay down this completed task, to which we have all given our best thought and effort during the last seven years, without a cordial expression of our appreciation of your unselfish and able services, and without giving you some visible token of our regard. We ask you to accept the accompanying ring—small in size, but big in meaning—as a recognition of our unanimous co-operation, and as a souvenir of the pleasant relations which have existed through all our meetings.

Yours very truly,

(Signed)

W. S. Davis,
R. H. Lush,
M. C. Smith,
T. W. Jutten,
Thomas Griffith,
G. Frank Beer.

COST STATEMENT
AS OF DECEMBER 31st., 1921

Total Cost, including Bridges and York County Widening, ...		$1,449,689.90
Deduct:		
Mimico Creek Bridge:.....	$36,951.63	
Etobicoke Creek Bridge:.....	33,438.10	
Credit River Bridge:.....	39,301.87	
Credit River East Bridge:.....	22,545.80	
Bronte Bridge:	34,797.21	
York County Widening:.....	93,454.16	260,488.77
Cost of Highway:.....		$1,189,201.13

for 35.28 miles, or $33,707.52 per mile.

Audited Financial Statements showing receipts and disbursements have been presented to the Honourable, the Provincial Treasurer, every month.

New Bridge Over the Credit River

Old Culverts Replaced by
New Reinforced Concrete Structures

APPENDIX

SPECIFICATIONS FOR ONE COURSE CONCRETE ROADWAY

MATERIALS

1. *Cement*—The cement shall be a well known brand of Portland cement of Canadian manufacture. It shall meet the requirements and tests of the Canadian Society of Civil Engineers. 2. *Fine Aggregate*—Fine Aggregate shall consist of natural sand or screenings from gravel. It shall consist of hard tough particles and shall be graded from fine to coarse, with the coarse particles predominating. Fine Aggregate when dry shall pass a screen having four meshes per lineal inch. Not more then five per cent shall pass a sieve having one hundred meshes per lineal inch, Fine Aggregate shall be free from vegetable or other deleterious matter. It shall not contain more than three per cent of clay or loam.

Fine Aggregate shall be of such quality that mortar composed of one part Portland Cement and three parts fine aggregate by weight when made into briquettes shall show a tensile strength at least equal to the tensile strength of briquettes of the same consistency made at the same time with the same cement and standard Ottawa, Illinois, sand mixed in the same proportion.

3. Coarse Aggregate—Coarse Aggregate shall consist of uniformly tough, hard, clean, durable crushed rock or gravel, graded in size, free from dust, loam, vegetable matter and coating which tends to hold the particles together, or any other deleterious matter.

Coarse aggregate shall be of such size as to pass a two inch round opening and be retained on a screen having four meshes per lineal inch. The intermediate sizes shall not be removed. It shall show a French Coefficient of wear of at least nine when subjected to the Deval Abrasion test.

4. Water—Water shall be clean, free from oil, acid, alkali, or vegetable matter.

5. Reinforcement—All reinforcement shall be free from excessive rust, scale, paint, or coatings of any character which will destroy the bond. It shall develop an ultimate tensile strength of not less than seventy thousand pounds per square inch, and bend one hundred and eighty degrees around one diameter and straighten without fracture.

6. Joint Filler—Joint Filler shall consist of two outer layers of felt impregnated with bituminous material enclosing a central filler of bituminous material, or some other acceptable form of built up bituminous material. The entire thickness shall not exceed one half inch.

7. Shoulders—Shoulder material may be the natural soil, unscreened gravel or broken stone.

8. Open Ditches—In general, open ditches will be considered to afford sufficient drainage for the roadway. The minimum depth shall be two feet below the level of the finished sub-grade. The minimum width of the bottom of the ditch shall be two feet. The side slopes shall be one and one-half to one. Such increase in depth and width shall be made as are necessary to carry off the water.

9. Tile Drains—Where for special reasons open ditches not desirable tile drains may be used. They shall be at least nine inches in diameter and the bottom of the trench shall be at least two feet below the level of the finished sub-grade. Pipe shall be laid with open joints and the trench back filled with suitable pervious material.

10. Underdrainage—All springy or boggy spots shall be drained by means of broken stone or tile under drains of sufficient capacity. Where possible all longitudinal drains shall be so placed that the nearer edge of the trench will be one foot beyond the edge of the concrete. Where drains are so placed that they will come beneath the finished concrete their location shall be carefully determined and noted.

The bottom of the excavation or the top of the fill when completed shall be known as the sub-grade.

SUB-GRADE

The Sub-grade shall be level for at least the width of the concrete when this width does not exceed eighteen feet. When the width exceeds eighteen feet the sub-grade shall be crowned in order to prevent an undue increase in the thickness of the concrete. The crown shall depend upon the crown given the finished surface of the roadway.

It is especially desirable that all parts of the sub-grade be evenly compacted. Where the soil is of such a nature that it can be compacted by rolling it shall be thoroughly rolled with a ten ton roller. When the concrete is to be placed on an old gravel or macadam roadbed, the old roadbed shall be loosened for the full width of the concrete and re-rolled so that the concrete will have an even bearing throughout.

Where of advantage the sub-grade shall be sprinkled before rolling. The sub-grade shall be checked after the side forms are placed before the concrete is deposited.

FORMS

Materials—In general the side forms will be of metal. Where wooden forms are used they shall be at least two inches thick and shall be capped with two inch angle iron.

Setting—The forms shall be carefully set to both line and grade and so held in place that they will not move out of place when the concrete is deposited.

All forms shall be free from dirt or mortar when they are staked in position.

PAVEMENT SECTION

The concrete pavement shall be eighteen feet in width, eight and one quarter inches in depth at the centre and six inches in depth at the sides. The finished surface shall conform to a parabola as shown on plan.

JOINTS

Width and Location—Transverse joints shall not be greater than one-half inch in width. They shall be placed across the pavement at right angles to the centre line of the pavement about every thirty-five feet. This spacing may be increased to fifty feet where the pavement is reinforced. All joints shall extend through the entire thickness of the concrete and shall be vertical.

The joint filler shall extend the entire thickness of the concrete and at least one-half inch above the finished surface. The filler shall be staked against a wooden header made of one inch boards. The header shall be carefully withdrawn as soon as the concrete is deposited on both sides of the joint and the concrete carefully worked up against the filler. The filler shall be of such section as to permit a divided float to be worked over it so that the concrete on both sides of the filler will be finished to the same elevation.

Before the road is open to traffic the excess filler extending above the surface shall be ironed down with a hot asphalt iron.

MEASURING MATERIALS

A bag of cement, eighty seven and one-half pounds shall be considered one cubic foot. The proportions of cement, sand and stone, will be secured by loading divided compartments in a steel dump car of one batch capacity to the proper heights, or by some equally satisfactory method. The amount of water added shall be such as to secure the same consistency for each batch.

MIXING

The drum of the mixer shall rotate at a speed of sixteen revolutions per minute and the mixing shall continue for at least one minute after all the materials for the batch are in the drum of the mixer. One batch shall be entirely discharged from the drum before the materials for the succeeding batch are introduced.

RETEMPERING

No mortar or concrete which has partially hardened shall be remixed or retempered, but material of this class shall be wasted beyond the limits of the paving.

PROPORTIONS

The concrete shall be mixed approximately in the proportion of one part of cement to one and one-half parts of sand to three parts of broken stone. The quantity of sand will be slightly varied, as the voids in the stone vary, but at no time shall there be more than a slight excess of mortar.

A cubic yard of concrete in place shall contain not less than one and eight-tenths barrels of cement.

CONSISTENCY

The materials shall be mixed with sufficient water to produce a concrete of rather stiff consistency. It shall be wet enough to settle to place when struck off with a template, but stiff enough to prevent the coarser aggregate from settling to the bottom of the concrete. There shall be no tendency for the mortar to separate from the course aggregate in handling.

PLACING CONCRETE

Immediately before the concrete is placed the sub-grade shall be brought to an even and evenly compacted surface. All ruts or other depressions shall be eliminated. The surface of the sub-grade shall be well wetted down, but there shall be no pools of water.

After mixing, the concrete shall be quickly deposited by means of the boom and bucket upon the sub-grade in successive batches. The entire thickness of concrete shall be placed in one operation and the batches shall be successively placed for the entire width of the pavement. In no case shall work be discontinued for any cause whatsoever except at a vertical

transverse joint. Where necessary the distance between transverse joints may be varied slightly to aid in the carrying out of this condition.

In case of a breakdown, concrete shall be mixed by hand to complete a section. Any concrete mixed in excess of that required to complete a section when work is discontinued shall be wasted outside the limits of the pavement.

FINISHING

The concrete shall be placed as nearly as possible in the proper quantities to prevent re-handling. The levelers shall so distribute it with shovels that there shall be a very slight excess of material in front of the template or strikeboard. The strikeboard shall be of proper shape to give the crown desired. It shall be faced with angle iron and will rest on the side forms. It will be moved slowly forward and at the same time slightly up and down and will be moved over the surface a sufficient number of times to remove all elevations and depressions in the concrete.

When the strike board is within three feet of a transverse joint all excess of material shall be removed from in front of it and the strikeboard lifted to the joint and worked away from it rather than towards it.

Every effort shall be made to have the longitudinal grade of the concrete surface unaffected by the joint.

The concrete shall be carefully worked down against the joint filler with steel trowels so that no voids or pockets will exist and special care must be exercised to have a dense uniform concrete for six inches on either side of the joint.

After the levelers have completed their work no one will be permitted to walk in the concrete. The strikeboard men will work outside the forms and the finishers will work from the bridges resting on the side forms. The concrete will be finished with a wooden float in such a manner as to compact the surface and leave it free from depressions or inequalities of any

MIMICO—BEFORE CONSTRUCTION AND AFTER

Old and New Bridges at Bronte

kind. The finisher shall follow closely after the strikeboard men but not so closely as to finish their work before the concrete has settled into position. They should complete their work just as the concrete is beginning to "catch."

The edges of the concrete shall be rounded with an edging tool having a radius of six inches.

PROTECTION

When the weather is hot, dry or windy, the concrete shall be covered with tarpaulins just as soon as the floating is completed. The concrete shall be sprinkled just as soon as the water will not pit the surface. When the concrete is twenty-four hours old the tarpaulins shall be removed and the concrete covered with at least two inches of clay, loam or sand. This covering shall be kept wet for at least ten days by sprinkling.

No traffic shall be permitted on the concrete until it is at least three weeks old and this period must be increased if the weather is damp or cool, or if the setting of the concrete is delayed for any reason whatsoever.

Before the roadway is open to traffic the earth covering shall be removed.

FREEZING TEMPERATURES

When there is any possibility of frost or freezing within forty-eight hours no concrete shall be deposited.

SHOULDERS

Shoulders shall be constructed of satisfactory materials as shown on plan.

REINFORCING

Reinforcing will be placed not less than two and one-quarter inches below the surface of the finished pavement. The exact location will depend upon the purpose for which it is intended.
Reinforcing will be used when the pavement is of greater width than eighteen feet and where foundation conditions require it. Where reinforc-

ing is used the concrete will be deposited in two operations but there will be no change in the mixture and not more than twenty minutes shall elapse between the placing of the portion below the reinforcing and the portion above it.

REPORT OF COLONEL W. D. SOHIER

GEO. H. GOODERHAM, Esq.,
Chairman of The Toronto and
Hamilton Highway Commission
Toronto.

Dear Sir:—

I much appreciate the confidence in my knowledge about roads which you showed in asking me to look over and report on the Toronto and Hamilton Highway.

I have studied roads and road-building very carefully, both in this country and in France and England for many years, and of course I have had twelve years' experience on the Massachusetts Highway Commission.

I have of late years been particularly interested in cement concrete roads because of the tremendous increase in the traffic of motor vehicles and particularly motor trucks, and because it seemed to me evident that new methods and new materials must inevitably be used on the main highways to economically and adequately carry this traffic.

We built our first concrete road on a State Highway in Massachusetts in 1906 on a main through line. It is still on the job, though it had to be patched in 1908 with tar and sand, and was given a surface coat of tar in 1909. The patching has been kept up constantly and the surface has had to be renewed about once in three years.

This road was of our then standard width (1906) 15 feet, with three-foot shoulders. It has since been widened to 18 and 21 feet, bituminous macadam being used.

Still, there it is, 14 years old, on a main trunk line, carrying over 1,500 vehicles on an average a day, and over 100 of them are heavy trucks.

I have been over the whole length of your concrete highway between Toronto and Hamilton in 1918 and this year, and looked it over carefully.

I do not know of any concrete road anywhere which had a better or more uniform mixture.

I did not observe a single place where the concrete had given out or where it was improperly mixed or laid. It is a great credit to you and your engineers and inspectors.

It was most excellently maintained everywhere, the cracks being filled with tar, which prevented them from breaking away at the edges and becoming rapidly large, which inevitably happens in a few years if they are not properly cared for and patched in time.

You must certainly congratulate yourself on having decided in 1915, when there was nothing like the present motor vehicle traffic, to construct a concrete road eighteen feet in width, instead of the 15 or 16 feet wide roads, which they were building in so many states—notably California, Michigan, Connecticut, New York, etc. In many states it isn't the fault of the builders, but they are bound by a statute.

You adopted the most modern and up-to-date specification and you certainly secured all you paid for.

I don't remember what the grading, drainage, culverts and bridges cost you, but the lowest bids that we have been able to secure here last year for this would make the concrete cost from $35,000 to $40,000 a mile for the concrete surface alone, so your 36 miles are worth to-day about $1,440,000 plus grading, drainage, bridges and engineering. Meantime, think what it's been worth to the users.

As I stated before, cracks properly maintained are a blemish, not a defect. Some of our roads are very much more cracked than any part of your road, and yet that road has

carried the traffic already eleven years and will many years more. We are thinking of relaying say 5 or 6 slabs 10 to 20 feet square on 8 miles of road, not because they won't stand the traffic, but to stop the talk.

It amused me a good deal to remember a talk I had in 1916 with some of your leading men about this particular highway, and that most of them practically demanded that the law required you to build the whole length and you must adopt a width 14 or 15 feet, if necessary, and a type of road, water bound macadam, perhaps with an oil or tar top, that you could build for the available money.

I wonder what they say now. One of the men I know who wanted that then, criticizes the road now as being too narrow. It is to laugh!

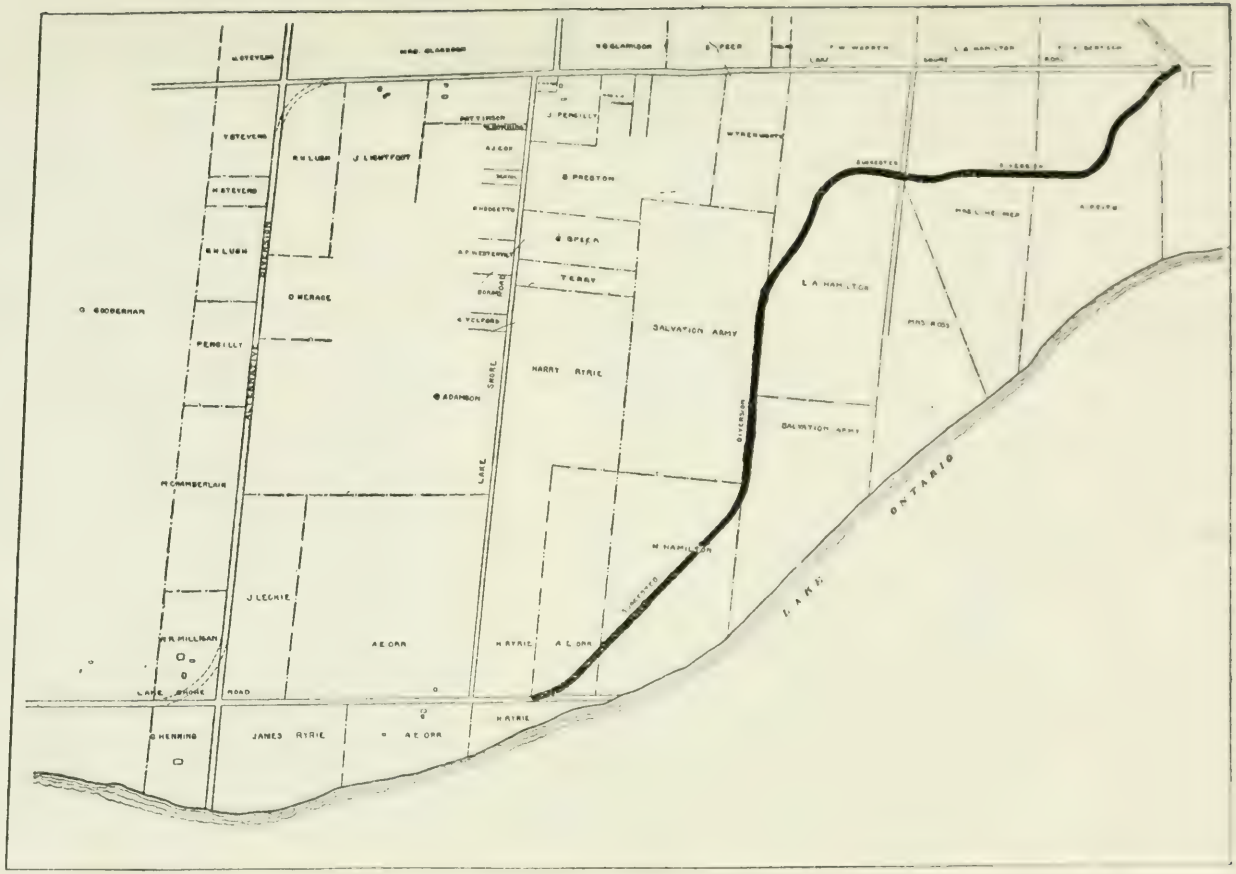
I consider your whole road most excellent, both in design and execution, and also excellently maintained.

I believe it would be better policy to build another road to take part of the traffic and so develop more valuable land, than to try to make this one wide enough (at least 32 feet) for the future traffic.

I certainly think that your fellow citizens owe your Commission a great deal for your foresight and courage in seeing far enough ahead to build the road you did, so that it not only carries your large traffic, but can be maintained at a small fraction of the cost of any of the other types used anywhere on such a road at that time.

Yours truly,

"W. D. SOHIER."



PROPOSED DIVERSION AT LORNE PARK

PRELIMINARY ESTIMATE OF GRADING

APRIL 10, 1915

(This Estimate includes only 31 miles of Highway westerly from the west boundary of New Toronto).

Item	Total	Unit	Unit cost	Total cost
			$	$
Clearing	14.72	Acres	50.00	736.00
Grubbing	7.23	"	200.00	1,446.00
Sodding	151,770.	Sq. yds.	.03	4,553.10
Excavation	161,794.	Cu. yds.	.40	64,717.60
" ditches	118,520.	"	.35	41,482.00
" borrow	12,000.	"	.35	4,200.00
Fill	204,810.	"		
Drainage course	2,267.	"	2.00	4,534.00
Scarifying	209,999.	Sq. yds.	.15	31,499.85
Fine grading	327,563.	"	.01	3,275.63
Rolling	474,907.	"	.01	4,749.07
12" weep tile	12,150.	Lin. ft.	.25	3,037.50
12" tile-approaches	10,440.	"	.65	6,786.00
18" tile-approaches	575.	"	1.00	575.00
24" tile-approaches	45.	"	1.50	67.50
30" tile-approaches	25.	"	1.50	37.50
Backfill for tile	3,209.	Cu. yds.	.25	802.25
Excn. con. cul. & pipe	2,474.	"	2.00	4,948.00
Backfill " "	665.	"	.25	116.25
Rip rap	299.8	"	2.50	749.50
Concrete culverts	1,470.	"	7.25	10,657.50
" culverts ext'd	1,455.	"	9.00	13,095.00
" reinforcement	56,153.	Lbs.	.05	2,807.65
Concrete pipe 12"	50.	Lin. ft.	.65	32.50
" " 18"	1,555.	"	1.25	1,943.75
" " 24"	605.	"	1.50	907.50
" " 30"	105.	"	2.00	210.00
Excn. con.culvt. & pipe (easier than ordinary)	2,299.	Cu. yds.	1.00	2,299.00
Backfill conc. culvt. & pipe (more expensive than ordinary)	1,107.	"	1.00	1,107.00
				$211,422.65

After Construction and Before

Before Improvement During Construction

The Completed Roadway

PRELIMINARY ESTIMATE OF GRADING

APRIL 10, 1915

(Summary showing Cost in various sections).

Section	Mile From	To	Dist. in miles	Estimated cost of grading	Average cost per mile	Percentage of total	
						cost	mileage
A	0	9.60	9.60	$ 78,836.20	$8,212.21	37	31.0
B	9.60	18.30	8.70	55,273.80	6,353.31	26	28.0
C	18.30	25.56	7.26	43,871.60	6,042.92	21	23.4
D	25.56	31.00	5.44	53,441.05	6,147.24	16	17.6
Total	.....	.....	31.00	$211,422.65	$6,820.08	100	100.00

An estimate of the probable cost per mile of finished paving made at this time was as follows:—

Preliminary Estimate as of April 10th, 1915.

Concrete pavment 18 feet in width with earth shoulders three feet in width on either side.

Cost per Mile

Grading (details in table)	$ 6,820.00
10,560 sq. yds. of concrete at $1.40 per sq. yd. say	14,784.00
1500 sq. yds. reinforced at $0.07 per sq. yd. say	105.00
Earth shoulders 600 cu. yds at $0.25	150.00
	$21,859.00
Engineering and general expenses. 6% say	1,311.54
Contingencies.....10% say	2,317.05
Total	$25,487.59
Cost for 36 miles, say	$917,553.24

YORK COUNTY ESTIMATE

Estimate of cost of constructing a 2′ macadam and 24′ concrete pavement from the West limit of the City of Toronto to the O'Connor Road. From the West limit of the City of Toronto to the West limit of the Village of New Toronto (on the South side of the Lake Shore Road) provision has been made for a curb and 11.5′ of boulevard also for replacing existing sidewalks that it may be necessary to remove. From the West limit of New Toronto (on the south side of the Lake Shore Road) to the O'Connor Road, this estimate provides for an open ditch on the South side instead of curb, tile drains, etc. Also this estimate does not include:

1. Extra right-of-way: All expense, surveys, property costs, land damages, etc. in connection with acquiring extra right of way at places where necessary, that is, from the West limit of the City of Toronto to Church Street in the Village of Mimico.

2. Bridge at Mimico Creek.

Summary	Dist ft.	Cost. $
Sheet No. 2F Etobicoke Township..... West limit of City of Toronto to East limit of Mimico.	5810	89,032.47
Sheet No. 3F Mimico.....	7557	103,203.84
Sheet No. 4F New Toronto..... From East boundary to West boundary on South side Lake Shore Road.	3304	38,898.44
Sheet No. 5F New Toronto and Etobicoke Township..... From West boundary of New Toronto on South side Lake Shore Road to West boundary New Toronto on North side of Lake Shore Road.	3314	34,172.15
Sheet No. 6F Etobicoke Township..... From West limit of New Toronto on North side of Lake Shore Road to West side of O'Connor Road.	5329	49,464.61
	25,314	314,771.51

DETAILED QUANTITIES AND LABOUR COSTS

West of Etobicoke Creek

February 28, 1917

Description of Work	Unit	Quantities	Total cost	Average unit cost
Clearing	Acre	16.44	1,035.20	63.63
Close cutting	Acre	0.70	59.70	85.29
Grubbing	Acre	8.48	624.11	73.69
Sodding	Sq. yd.	322,259.00	8,803.52	0.0273
Excavation				
Solid rock	Cu. yd.	1,811.00		
Loose rock	Cu. yd.	180.00		
Hard pan	Cu. yd.	53,802.00		
Earth	Cu. yd.	183,888.00		
Borrow	Cu. yd.	132.00		
Extra haul	Cu. yd.	120,364.00		
Cost			119,834.44	0.48
Scarifying	Sq. yd.	144,569.00	1,623.85	0.0114
Rolling				
Sub grade	Sq. yd.	374,648.00	5,890.05	0.0135
Fills	Sq. yd.	62,265.00		
Fine Grading				
Earth	Sq. yd.	208,857.00		
Hard pan	Sq. yd.	130,654.00	18,752.14	0.055
Drainage course				
Crushed stone	Cu. yd.	1,397.00	1,606.55	1.16
Gravel	Cu. yd.	2,164.00	1,251.13	0.58
Transportation team				
Train	Ton mile	2,882.00		
Cr. stone	Ton mile	1,954.00	534.43	0.099
Gravel	Ton mile	608.00		
Foundation excavation				
Earth dry	Cu. yd.	14,531.00		
Hard pan dry	Cu. yd.	8,488.00		
Loose rock dry	Cu. yd.	146.00		
Solid rock dry	Cu. yd.	578.00	16,651.08	
Earth in water	Cu. yd.	397.00		
Hard pan "	Cu. yd.	575.00		
Loose rock "	Cu. yd.	26.00		
Solid rock	Cu. yd.	41.00		
Culverts				
Unwatering			560.24	
Team transportation materials	Ton mile	5,803.00	2,444.30	0.41
Reinforcement	Lbs.	55,169.00		
Concrete	Cu. yd.	1,535.90	6,565.59	4.30
Backfilling	Cu. yd.	1,620.00	977.18	0.61
Coffer dams	F.B.M.	5,498.00	143.03	0.026

DETAILED QUANTITIES AND LABOUR COSTS—Continued

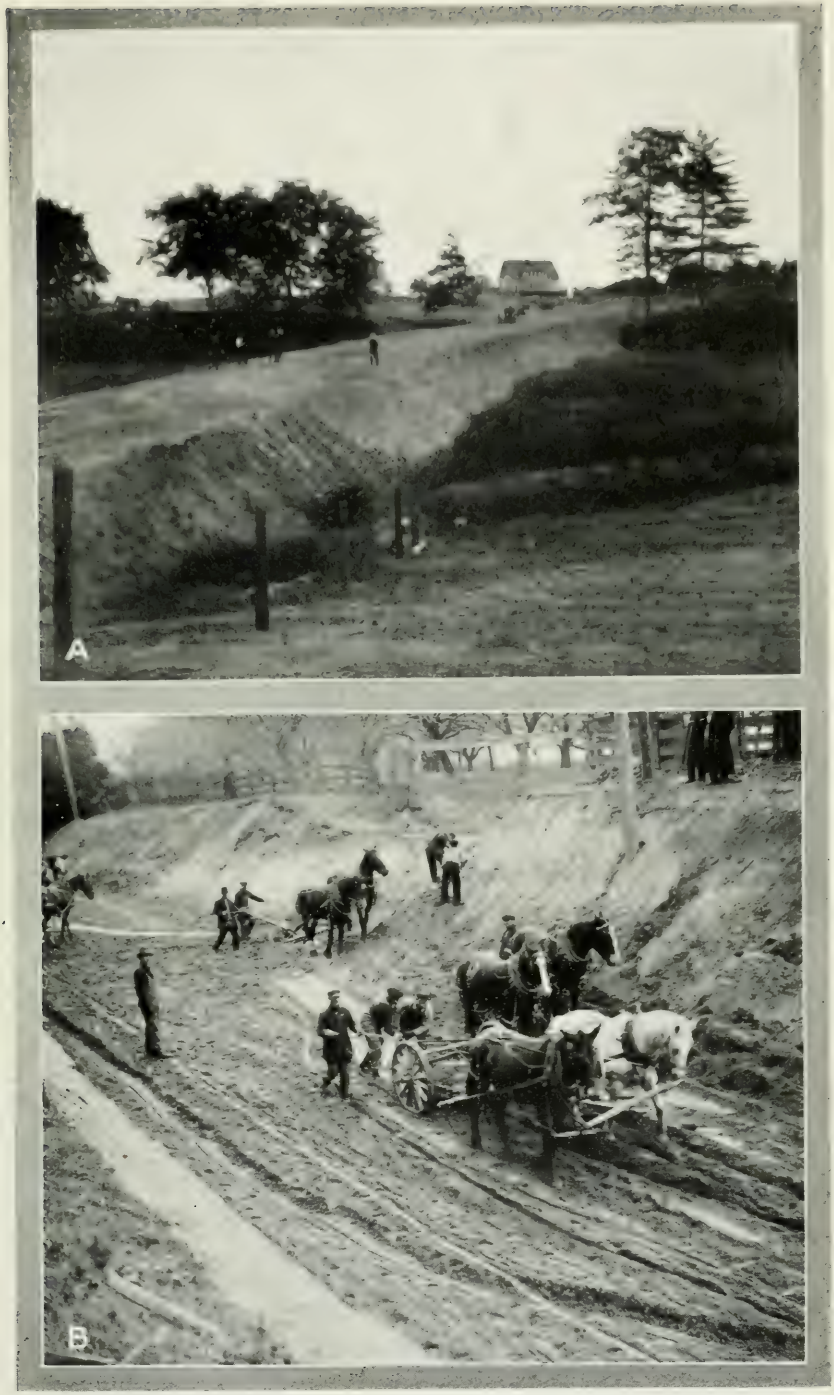
Description of Work	Unit	Quantities	Total cost	Average unit cost
Manholes and catch basins				
Concrete	Cu. yd.	177.30	2,343.82	
Brick		36.40		
Temporary crib work				
Round timber	Lin. ft.	6,220.00	116.18	0.017
Iron	Lbs.	500.00		
Paving—dry	Cu. yd.	14.00	10.88	0.78
Pipe				
Corrugated 8″	Lin. ft.	60.00		
" 12″	"	94.00		
" 18″	"	70.00	109.48	0.20
" 24″	"	25.00		
" 30″	"	76.00		
" 48″	"	233.00		
Concrete 10″	Lin. ft.	157.00		
" 12″	"	9,445.00		
" 18″	"	2,073.00	775.27	0.06
" 24″	"	350.50		
" 30″	"	694.50		
Pipe				
Transportation team and train	Ton mile	3,460.00	2,840.75	0.82
Backfilling				
Crushing	Cu. yd.	828.80	993.84	1.20
Earth	Cu. yd.	6,031.00		
Gravel & field stone	Cu. yd.	8,931.00	5,951.72	0.34
Crushed stone	"	2,605.00		
Cinders		192.00		
Transportation field stone & gravel	Ton mile	13,846.00	10,176.21	0.74
Transportation crushed stone	"	5,367.00	1,343.22	0.25
Clay Pipe 4″	Lin. ft.	15,208.00		
6″	"	27,498.00		
6 x 6″	"	6,036.00		
8″	"	3,730.00		
9″	"	120.00	1,954.95	
10″	"	185.00		
12″	"	44,648.00		
15″	"	10.00		
18″	"	3,143.00		
24″	"	162.00		

DETAILED QUANTITIES AND LABOUR COSTS—Continued

Description of Work	Unit	Quantities	Total cost	Average unit cost
Retaining Walls				
Masonry	Cu. yds.	57.20	465.44	4.78
Concrete	"	40.20		
Timber	F.B.M.	21,148.00	201.24	
Ties		350.00	77.43	
Iron	Lbs.	964.00		
Rip Rap				
Hand laid	Cu. yds.	319.20	649.12	2.03
Loose	"	11.00	13.01	1.18
Transportation	Ton mile	452.50	458.27	1.01
Temporary trestles				
Round timber	Lin. ft.	500.00		
Flatted timber"		28,200.00		
Square timber	F.B.M.	3,640.00		
Iron	Lbs.	234.00		
Steel rails		9,480.00		
Transportation	Ton mile	161.00	218.28	1.36
Bridges				
Excavation				
Earth dry	Cu. yd.	1,648.00		
Hard pan dry	Cu. yd.	404.00		
Solid rock	Cu. yd.	156.00	2,975.58	1.19
Earth in water	Cu. yd.	55.00		
Hard pan "	Cu. yd.	10.00		
Solid rock "	Cu. yd.	239.00		
Coffer dams and shoring sawn timber 2 x 10	F.B.M.	790.00	137.29	0.18
Piles				
Number	No.	52.00		
Left in work	Lin. ft.	1,664.00	270.92	0.14
Cut off	"	156.00		
Backfilling	Cu. yds.	819.00	1,080.92	1.32
Reinforced concrete				
1—2—4 mix	Cu. yds.	1,700.50	8,594.65	5.06
Reinforcement	Lbs.	63,283.00		
Transportation				
Train	Ton mile	3,755.00	3,244.14	0.36
Team	"	5,500.00		
Fencing				
Length fenced	Rods	186.00		
Wire	"	186.00	102.78	
Fence posts	No.	136.00		
Gate and anchor posts	"	6.00		
Gates	"	2.00		

DETAILED QUANTITIES AND LABOUR COSTS—Continued

Description of work	Unit	Quantities	Total cost	Average unit cost
Land surveyors monuments	No.	372.00		
Concrete	Cu. yds.	16.00	843.10	
Reinforcement	Lbs.			
Guard rails				
Wooden	Lin. ft.	640.00	25.32	
Concrete	"	1,397.00	829.23	0.60
Reinforcement	Lbs.	1,630.00		
Roadway				
Macadam surfacing	Sq. yds.	11,912.00	1,819.61	0.15
Concrete surface	Sq. yds.	312,102.00	85,741.10	0.275
Reinforcement	Sq. yds.	101,694.00	679.02	0.007
Water	1000 gals.	16,077.00	1,774.17	0.110
Transportation teams	Ton mile	2,153.00	99,265.49	0.255
Train and team train	"	386,077.00		
Shoulders				
Crushed stone	Cu. yds.	1,785.00		
Earth	"	18,362.00	9,050.65	0.50
Approaches				
Crushing stone	Cu. yds.	753.00		
Crushed stone	"	1,711.00	715.51	0.36
Gravel	"	269.00		
Transportation team				
Crushed stone	Ton mile	4,630.00	1,498.70	0.33
Gravel	"	302.00	851.15	



GRADING

The Maximum Grade is 4%

YORK COUNTY WORK

Final Statement

Statement of expenditure up to January 31st, 1920, upon construction of 24′ concrete roadway from West limit of City of Toronto to the O'Connor Road.

Item		Unit	Quantity	Unit c ost	Total cost
1	Scarifying				
2	Removing old pavement	Lin. ft.	11029	.8281	$ 9,133.53
3	Grading	Cu. yd.	22051	1.364	30,077.00
4	Borrow				
5	Rolling	Sq. yd.	73204	.01916	1,402.54
6	Excn. in foundations	Cu. yd.	1347	1.7983	2,422.35
7	Concrete pipe, 12″	Lin. ft.	512.5	1.0143	519.85
8	" " 18″	"	498	4.2556	2,119.29
9	" " 24″	"	64	4.8683	311.57
10	" " 30″	"	64	6.3619	407.16
11	Culverts reinforced	Cu. yd.	134	21.3373	2,859.21
12	Concrete head walls				
13	Rip rap				
14	Excn. for tile drains (including backfill)	Cu. yd.	11321	1.1295	12,786.70
15	Stone backfill	Tons	2952	3.7665	11,118.81
16	Pipe laying	Lin. ft.	42476	.04	1,698.82
17	Vitrified pipe 9″	Lin. ft.	42476	.1382	5,869.68
18	" " 15″	"	422	.353	148.88
19a	" " 18″ 24″	"			1,574.97
19	" elbows and T's				205.82
20	Catch basins	Each	88	51.894	4,566.67
21	" pipe & grate				
22	Fine grading	Sq. yd.	70103	.08673	6,080.38
23	Concrete pavement reinf.	Sq. yd.	67527	2.4761	167,200.76
24	Extra reinforcing	"	33265	.1430	4,757.33
25	Concrete curb	Lin. ft.	19612	.2874	5,636.30
26	Sidewalks—new				14,791.33
27	" removing old				360.37
28	Moving poles				2,839.73
29	Shoulders-earth				
30	Guard rail				
31	Stone for street approaches				
32	Radial changes				
33	Macadam	Sq. yd.	9932	.7702	7,649.78
					$296,649.18
	Of this total, $288,993.20 was expended prior to 31st. January 1919—therefore add interest at 6% on $288,993.20 for one year				17,339.59
					$313,988.77

As the estimated cost exclusive of interest charges was $314,771.51 the actual cost was $18,122.33 within the estimate a noteworthy showing in such unsatisfactory years for construction work as 1917 and 1918.

TESTS OF FINE AGGREGATE

1-3 Mix

Sample No.	Sieve Test % 50 Mesh	Sieve Test % 100 Mesh	% Silt	Tensile Strength 3 dys.	Tensile Strength 7 dys.	Tensile Strength 28 dys.	Remarks
1	11.5	1.8	0.9	275	454	603	4½ Cu. yd. 0.50 unscreened...
2	14.2	3.7	2.0	265	385	558	1½ Cu. yd. 0.50 " ....
3	16.1	1.9	0.6	118	203	348	
4	9.2	1.1	1.7	228	303	433	1½ Cu. yd. 0.50 pit run.....
5	4.6	1.6	1.3	274	292	510	.20c. Ton at pit screened.....
6	10.3	2.2	2.6	250	243	382	" " " " " .....
7	3.1	0.9	1.2	123	240	378	Sell pit for $5,000.....
8	3.0	0.7	1.4	271	361	467	
9	7.7	1.8	2.8	303	436	431	
10	13.4	3.5	2.0	210	330	436	Broken at 34 days.....
11	9.8	3.4	1.1	205	256		
12	5.2	0.9	1.4	226	343	566	Pit run 1½ Cu. yd. 0.50 at pit.
13	19.6	4.1	2.7	186	291	433	
14	3.3	2.5		265			
15a	7.3	1.3	0.9	190	311		
b	4.6	0.5		165	333		
16	23.5	11.7	9.1	200	311	455	60c. F.O.B. Pit Cu. yd.....
17	20.0	1.5	0.15	126	221		
18	18.5	11.2		278	436	620	
Standard Ottawa Sand				156	268	380	
Neat Cement				24 hr. 225	616	666	

Sample No	Sieve Test % 50 Mesh	Sieve Test % 100 Mesh	% Silt
19	50.3	12.0	3.2
20	33.1	9.5	3.0
21	18.1	2.5	0.8
22	12.4	1.1	1.0
23	1.6	0.8	1.6
24	10.6	2.8	1.8
25	58.3	2.6	
26	9.7	3.7	8.5
27	17.0	1.5	1.4
28	10.2	4.1	2.7
29	10.7	4.4	4.2
30	63.2	19.2	2.0
31	11.2	4.0	5.2
32	9.2	4.9	8.7
33a	1.3	0.6	2.4
b	4.8	1.6	1.5
34	3.6	0.7	1.9
35	32.4	7.0	7.0
36	38.0	8.3	
37	4.2	0.7	0.4
38a	28.3	7.3	4.9
b	11.7	0.9	1.7
c	36.7	2.4	
39	35.1	30.1	

Office of the Chief Engineer, Toronto, April 7th, 1915

REFERENCE

1.— E. Goodale, Hamilton
2.— Thos. McCurr, Aldershot
3.— E. Still, Oakville.
4.— Jno. Wilkins, Clarksons.
5.— Rocsand and Gravel Co., Erin.
6.— Maple Sand and Gravel Co., Maple.
7.— A. Snyder, Hamilton.
8.— Edward New, Galt.
9.— Vaughan Sand and Gravel Co.
10.— Southworth, Woodbridge.
11.— D. McNabb, Orillia.
12.— W. Oughtred, Clarksons.
13.— York Sand and Gravel Co.
14.— Godson Cont. Co., Blackwater Jct.
15.— National Sand and Gravel Co.
16.— " " " "
17.— " " " "
18.— Ontario Rock Co., Preniveau.
19.— Godson Cont. Co., Burketon Jct.
20.— Shaver and Burke, Clarksons.
21.— Giddings, Oakville.
22.— T. H. & B. Mt. Pleasant.
23.— N. H. Howard, Aldershot.
24.— Sand and Supply Co., Ayr.
25.— Jno. Ritchie, Port Credit.
26.— W. Pinchin, Clarksons.
27.— W. D. Flatt, Hamilton.
28.— Armstrong Supply Co., Hamilton.
29.— W. H. Cooper, Hamilton.
30.— G. Caver, Port Credit.
31.— T. Fenwick, Summerville.
32.— Taylor, Bronte.
33.— W. Pinkney, Cooksville.
34.— W. Oughtred, Clarksons.
35.— York Sand and Gravel Co.
36.— Cataract Sand and Gravel Co.
37.— G. T. Gallagher, Aldershot.
38.— Hamilton Sand and Gravel Co.
39.— Canada Crushed Stone Corporation, Dundas.

TESTS OF COARSE AGGREGATE

Sample	Tested by	Specific gravity	Absorb'n.	Per cent. wear	French coeff.	Toughness.	Hardness.	Cement'n.
1	C. a	2.65	0.167	8.29	4.90	7.00		
	b	2.62	0.54	8.29	4.80			
	c			6.80	5.90			
2	C. a	2.74	0.102	4.36	9.00	5.00		
	b	2.71	0.104	3.30	12.10	5.00		
	T. a	2.71	0.130	6.10	6.50	5.20		19.2
	b					5.50		
3	C.	3.06	0.09	2.30	17.30	22.00		
	W. a	3.00	0.19	2.90	13.60	13.00	17.90	
	b	3.00	0.31			24.00	18.30	
4	C.	2.69	0.304	5.00	8.00	5.00		
5	C.	2.79	0.05	5.40	7.40	6.00		
6	C.	2.68	0.23	4.70	8.50	6.00		
7	C.	2.68	0.41	4.06	9.80	10.30		
	W. a		0.93	3.00	13.20	12.00		
	b	2.65	0.93			12.00	18.80	
8	C.	2.77	0.76	5.10	7.80	9.30		
9	C.	2.76	0.68	3.80	10.50	11.30		
	W. a	2.80	0.81			10.00	14.30	
	b	2.75	0.61			10.00	15.80	
	c	2.75	0.65	3.80	10.40	13.00	15.90	
	d	2.75	0.93	3.60	11.20	11.00	15.40	
	e	2.80	1.17	2.90	13.70	14.00	15.80	
	f		0.31			12.00		
	g		0.61	2.90	13.70	10.00		
	h		1.17			14.00		
10	C.	2.71	0.48	3.70	10.80	10.00		
	T.	2.70	0.53	5.41	7.39	11.00		
11	C.	2.69	0.106	5.10	7.80	7.00		

Office of the Chief Engineer, Toronto, March 31, 1915

REFERENCE

Tested By

C. Toronto & Hamilton Highway Commission.

T. University of Toronto

W. Washington.

1.— Ontario Stone Corporation, Uthoff, Ont.
2.— Point Ann Quarry, Belleville, Ont.
3.— Ontario Rock Co., Ltd., Preniveau.
4.— Quinlan and Robertson, Crookston, Ont.
5.— Gravenhurst Crushed Granite Co., Midland, Ont.
6.— Central Prison Farm, Guelph.
7.— Hagersville Contracting Co., Hagersville, Ont.
8.— Canadian Quarries, Stoney Creek.
9.— Canada Crushed Stone Corporation, Dundas.
10.— Wentworth Quarries, Vinemount, Ont.
11.— Crushed Stone Ltd., Kirkfield, Ont.

COMPARATIVE MAINTENANCE STATEMENT FOR 1916, 1917, 1918, 1919, 1920, 1921.

	1916	1917	1918	1919	1920	1921
ROAD SURFACE:						
Concrete	$ 642.49	$1,715.98	$2,195.59	$1,726.68	$2,533.75	$2,620.13
Macadam	1,306.16	3,174.30	9,726.98	7,491.90	4,077.61	7,828.24
SHOULDERS: Including Washouts, etc.		566.85	1,565.10	3,697.26	3,128.46	3,421.96
SNOW REMOVAL			2,560.57	905.30	2,347.50	1,157.68
MISCELLANEOUS: Repairs to Guard Rail, Drains, Cleaning Ditches, Fences, etc.	2,942.85	739.80	3,379.77	5,097.39	5,130.10	6,436.04
BRIDGES			1,770.13			955.55
STOREHOUSE: Tool House, etc				1,503.07		
PLANT: Office Furniture, Automobile and Motor Trucks				7,779.26	2,186.98	1,248.76
DAMAGE CLAIM and Expenses					1,960.95	2,054.60
GENERAL: Including Rents, Salaries, Legal Expenses, Printing, Stationery, etc.	623.96	1,161.40	2,905.35	3,017.84	6,287.14	4,415.63
BETTERMENT:						
Pathways						5,199.60
Trees	1,145.33	1,442.31	3,047.74	2,416.75	708.04	1,209.43
Carried forward	$6,660.79	$8,800.64	$27,151.23	$33,635.45	$28,360.53	$36,547.62

COMPARATIVE MAINTENANCE STATEMENT—Continued

Carried forward—	$6,660.79	$8,800.64	$27,151.23	$33,635.45	$28,360.53	$36,547.62
LESS CHARGED to Municipalities under agreement as their share of repairs to unfinished part of road and pathways			2,813.33	6,418.37	1,258.58	5,968.44
	$6,660.79	$8,800.64	$24,337.90	$27,217.08	$27,101.95	$30,579.18
NET RECEIPTS: Fines Account	1,858.98	9,707.22	26,317.57	14,973.27	24,184.07	23,907.72
	Dr. $4,801.81	Cr. $906.58	Cr. $1,979.67	Dr. $12,243.81	Dr. $2,917.88	Dr. $6,671.46

Maintenance of Concrete Road Surface in 1916	(16 miles)	$ 40.14 per mile
Maintenance of Macadam Road Surface in 1916	(1.17 miles)	1,116.17 per mile
Maintenance of Concrete Road Surface in 1917	(29 miles)	59.17 per mile
Maintenance of Macadam Road Surface in 1917	(1.7 miles)	1,867.23 per mile
Maintenance of Concrete Road Surface in 1918	(36 miles)	60.99 per mile
Maintenance of Macadam Road Surface in 1918	(1.7 miles)	5,721.75 per mile
Maintenance of Concrete Road Surface in 1919	(36 miles)	47.96 per mile
Maintenance of Macadam Road Surface in 1919	(1.2 miles)	6,243.25 per mile
Maintenance of Concrete Road Surface in 1920	(36 miles)	70.38 per mile
Maintenance of Macadam Road Surface in 1920	(1.2 miles)	3,398.01 per mile
Maintenance of Concrete Road Surface in 1921	(36 miles)	72.78 per mile
Maintenance of Macadam Road Surface in 1921	(1.2 miles)	6,523.53 per mile

TORONTO, November 1st, 1921.

DETAILS CONCRETE PAVING COST

Total quantity of paving laid to October 31st, 1915 131,519 square yards

Materials required.			Cost per sq. yd.
Cement, 205,304 bags,—51,326 barrels at $1.35		$71,856.40	$0.526
Sand, 16,093 tons at 0.88		14,161.84	0.107
Stone, 29,818 " at 0.95		28,327.10	0.215
Joints, per 100 lineal ft. of material at $2.39			0.006
Labour.			
Joints, mixing and placing		$25,488.65	$0.190
Loading and teaming to job,			
Hauling	$13,383.98		
Unloading $1,241.26			
3,074.12			
1,382.46			
	5,697.84		
Track laying	7,755.18		
Track maintenance	3,371.69	30,208.69	0.229
Total			$1.273

These figures do not include an allowance for plant depreciation and are exclusive of costs for management or engineering. The laying of concrete continued into November, the total yardage for the year being 162,841 sq. yds.

University of Toronto
Library

DO NOT
REMOVE
THE
CARD
FROM
THIS
POCKET

Acme Library Card Pocket
Under Pat. "Ref. Index File"
Made by LIBRARY BUREAU

172159
Toronto and Hamilton Highway Commission
Report...
EcT
T6863r

UTL AT DOWNSVIEW
D RANGE BAY SHLF POS ITEM C
39 14 05 25 09 008 9